- ***Dr. Streveler: Welcome to the Research Briefs Podcast.***

  I'm your host, Ruth Streveler, coming to you from the School of Engineering Education at Purdue University.

  The goal of Research Briefs is to expand the boundaries of engineering education research. In these podcasts we'll speak to researchers about new theories, new methods, and new findings in engineering education research.

  My guest today on Research Briefs is Dr. Robin Adams, professor of Engineering Education at Purdue University. Robin was part of the first cohort of faculty hired after Purdue's Ph.D. program in Engineering Education was established. And she was instrumental in creating courses and procedures in the programs.

  I should say that Robin has been a colleague and friend of mine for almost 20 years and she was an important reason that I came to Purdue myself. So, it's fun having a chance to speak with her. And Robin knows all of the old stories about how we both came here.

  Welcome to Research Briefs, Robin.

- **Dr. Adams: Thank you. Thank you for inviting me, I am excited to do this.**

- ***So, I know you well and know a bit of your story but not all of our listeners are as lucky as me. So, can you provide us a little bit context about how you got into engineering education research?***

❖ **I will admit it's like now when I look back in time and think, "Wow, I've been in this for almost 30 years, where did the time go?" But I got a degree in mechanical engineering, worked in Silicon Valley in electronics, go figure. And yes, for those who know me, I get bored easily and so I'd been there for a while and decided I needed something that's more of a challenge and was talking with colleagues and they said, "Well what about a master's in material science?" And I ended up at the University of Washington. And that was the gamechanger.**

So, one of the things that they do, is they have you go and meet the faculty. I met Gretchen Kalonji. I talked about some things that I had done in the summer at an ocean awareness day camp. And she went, "Hmm, are you interested in engineering education?" And of course, at that point I went, "Well, what's that?" And that was the beginning. That was the turning point.

And, so for those of you who don't know, Gretchen Kalonji was the PI for the ECSEL Coalition (Engineering Coalition of Schools for Excellence in Education and Leadership), so the NSF funded, I don't know the number's always a little bit wonky, but 5-ish coalitions, and the University of Washington was one of them. And so, with her, I got to be involved in a lot of different kinds of things: doing assessments, developing curricular, doing

summer technology camps, doing retention studies, trying to evaluate the first-year engineering, first-year design kind of courses.

- ***Did you know then that you were interested in design?***

- **Ah, that's such a good question. I knew I was interested in design, but I don't know if I had like Big D – Design identity in my head. So, as a little kid I was always making things and poking around and thought I would build houses under the ocean and then live in them. Which was the reason why somebody said I should be a mechanical engineer. But I don't know, that's a head scratcher.**

  And then when I went into industry, I was a designer, and then I became the senior designer. So, it was an actual title. And I had a sort of strange, atypical, I think, design role in the sense that I did a lot of one-offs that we made bajillions of. So, I worked with Motorola, and IBM, and National Semiconductor, and Apple, and cardiac pacemakers, and swatch watches, and I was a designer. And when Gretchen met me, I think one of the things that intrigued her was that I kind of had this design story and a lot of the things that we were doing in ECSEL, our storyline was, integrating designs throughout the experience. And it was only really over time that I started to realize that was my thing. It was the thing that I study, it's the thing how I am, it's the thing that I teach, and it gives me lots of flexibility.

- ***Sometimes I find with different identities that somebody has to remind me that I have that identity because it's so inward, you're not even***

aware of it. And then somebody says, "You do this," and like, "Really?"

- **Yeah. And I think as a kid I was the artsy design time. And then in industry I was sort of an engineering design type, and now I'm sort of the esoteric-y, you know, design thinking philosophy research-y type. So, it's changed a lot. I kept all of those pieces, but it's changed a lot.**

  - ***And then when I met you, you were at the Center for the Advancement of Engineering Education at the University of Washington.***

- **So, from ECSEL, somewhere at the end of the ECSEL grant, Denice Denton came, and she was our dean, and she recruited Cindy Atman from Pittsburg. And she started the Center for the Engineering Learning and Teaching work help. And I got involved with them and that sort of even pushed the design story more. For those of you who know Cindy, that's her big area is design. And through CELT we wrote the Center Grant and part of our storylines intersecting were creating use opportunities for bringing faculty into doing engineering education research. And so, we have a lot of crossover there and I think you were an advisor on our summer, and I was an advisor on your projects and we had a lot of great conversations.**

  - ***Cross-pollination, yes we did. So, then the department, which was the department started up here?***

- **Yeah, I had many late-night cocktail hours with Kamyar Haghighi who was the original head of the program when it did transition in with the big**

architect around it at FIE and ASEE we hook up. He's like, "When do you have time at the end of the day? So, all of these late-night cocktail meetings and got recruited, you know. And it seemed like a really nice opportunity to expand in that building capacity place.

And then, the other storyline that it had for me was the interdisciplinary thing. So, as you might imagine that's another part of my identity. So, yeah. A quirky path is the thing that means you're here. Welcome to the community, you have a quirky path, we get you.

- ***Although now there's some people that don't have a quirky path anymore which kind of freaks me out.***

❖ **Yeah, but it still has some quirky. You know, 'cause I remember the first cohort we asked them to just kind of tell a little bit about their story and why they came here. And as I listened, I was hearing, "It's the thing that I never knew I was always looking for." And I think that's still the same. I think that's still maybe the same for us and the same for this group, and I think it's the same for the people who come to us and at some point, it will change and that will be an interesting moment.**

- ***Yes, yes. So, I've asked you today not to speak about design which was kind of weird. But there's a method called photo elicitation that I'm just intrigued by and I learned about it first from you, and you've done it way more than me. So, that's what we're going to talk about today, mainly. So, could you start by telling people what photo elicitation is, kind of a***

definition?

- **Well the nice thing is photo elicitation is actually like a couple of big cues. It involves photos and you use the photos to elicit what knowledge people have about something. And that knowledge could also be identity, it's not knowledge about, you know, like physics, it's just knowledge very broadly defined.**

  - ***Not necessarily factual knowledge?***

- **Not necessarily factual knowledge; it's particularly good when you're trying to get at kind of abstract knowledge, or very tacit knowledge, that kind of knowledge where you need something to pull it up from your memory to be able to talk about it and explain what it means and why it's important.**

  So, it's a qualitative research method. You either bring photos or you have people bring their own photos. And then the interview protocol is a semi-structured protocol that essentially starts what is it that this image represents for you. And then a number of probes going, "Can you say more? Why is that important for you? How does that relate to whatever?" But yeah, so I've used it for a number of times.

  The key idea is that the image helps elicit. The image in itself is sort of like don't get caught up in the image; it's the image elicits. And so, it's really good at helping people conceptualize their knowledge, conceptualize their pathways, all of these types of things that are so deeply embedded that

they're hard to get to.

- ***And you used this about 15 years ago, 10 years ago? When was this that you first used it?***

❖ **So, as part of ECSEL, as you might imagine, a lot of the evaluation questions were trying to get at how has your understanding of engineering changed? And as a good graduate student I was like, "Well, just come up with a good question and see how they answer it." And what happens is they say, "Engineering is the application of math and science to do something good." And the "do something good," might differ but it sort of had that quality. And I was working with Sally Fincher and she was also doing kind of one of the engineering education research or bring faculty in things in Sweden.**

- ***Maybe this could get divergent. Because Sally's from the University of Kent in the UK. And the Sweden was this the one at Uppsala?***

❖ **It was at Uppsala with Arnold Pears and Mats Daniels. And Sally Fincher, I think you know if you're going to sort of put a pin in a history, Sally Fincher with Marian Petrie did these computer science education research programs with faculty to bring them into research. And so, they were sort of my model in many ways for what I did with the institute, and so they came before me. And one of the things that they did that was unique was that they would sort of hook into a big question, and for the Swedish group it was sort of "What's Engineering?" And they would put together a kit and the kit had a couple of different instruments and the idea was that each**

person involved in this project would go and collect data at their school. And then sort of that would go into a big repository and everybody could see everybody's data. And you could just focus on your data, you could focus on all the data that had to do with Part X of the kit. And so, it was collectively created and collectively analyzed and there's all these neat cross-conversations. And so they were doing it in Sweden and engaged faculty from, they were trying sort of get all of the Swedish universities and we were playing around with this, "What's Engineering."

And Sally and I were talking and I said, "Well, you know, if you ask people what they think engineering is you get this kind of like slogan-y kind of answer." And we puzzled and puzzled, and at one point I kind of had this ah-ha moment of like, "Well what's something that helps people talk about stuff that they don't have words for really easily?" And I was like, "pictures, a picture tells us 1,000 words kind of thing," and both of us started poking around and we're like, oh, there's this photo elicitation technique that's been around well probably before the 1950s but that was the first thing that we found. And we thought, ah-ha we think we found something. And so that was kind of like the first instantiation so that was like 2007 as a project.

- ***And you have continued to use it.***

❖ **I continue to use it. And so, for that project we were trying to get at what they thought is engineering, and I can share some examples of that. I used it on a longitudinal study in terms of the crossdisciplinarity idea. And so, what people understand about that idea. I looked at identity and identity**

formation in those spaces because one of the nice things photo elicitation allows you to do, not just get at sort of conceptual understanding, but the link between conceptual understanding and identity. And that was sort of in the early phases of when people were really trying to dig into identity.

We've used it recently in terms of following up with all of those folks who were involved in our centers on engineering education research and going back and getting their stories about their experiences, their conceptual understanding, the sort of paradigm shifts that they've had, and all those types of things. And so, it's kind of one of my favorite go-to techniques because I tend to play in these spaces where right and wrong answers aren't really what it's at but like what meaning do these have for you and how does that shape what you do?

- ***So, when we were doing this joint study, I know the students that were interviewing people said that the folks who were interviewed said they spent a lot of time figuring out the pictures. Because we asked them to bring the pictures. And I think you have other work that kind of triangulated with that, some prior work, right?***

- **Yeah, so, when we were piloting some of these ideas Shawn Jordan and Shanna Daly were working with me. And we were looking into this idea and we said, "Well let's explore some of these things." Some people might look at this and go, "Yeah, just people talking about stuff. What do you really get out of it? Are people really being thoughtful about the images that they bring?" And we did some work on that and we also included focus groups,**

and interviews and we had them talk about how did they go about finding these things. And they would spend, even if they went on Google, they would spend 20+ minutes trying to find the thing that captured the idea in their head that they didn't have words for. So, it was really good at getting at metaphors, or they would go like, "Oh, there's a photo that reminds me of a memory that I want to talk about that's somewhere in my album." And, you know, we'd hear these stories of digging through the closet and trying to find *that* photo.

And so, for Shanna that photo was a picture of the side of their house and her dad's car parked up kind of in the driveway. And, you know, you might go like, "Oh, car." Like this is about cars and it had nothing to do with cars. It had to do with her memory of a time when her dad was trying to fix something that was either on the roof or something like that, and the ladder that they had wasn't tall enough. And so, he didn't want to go and buy a new ladder, he wanted to sort of design in moment and so he backed up the car to the wall of the house, opened the trunk, put the ladder in the trunk and then secured it, I don't know how safe it was but secured it, and then was able to resolve the thing. And so, she talked about ingenuity and how engineering is about ingenuity which is kind of much more nuanced than 'application of math and science to do stuff.' In fact, I'm not entirely sure where the application of math and science was in there.

So, we tried it out and piloted it to sort of learn how thoughtful are the decisions that go behind finding these photos. And from the work I did with Sally we provided photos versus having people bring photos 'cause we

thought that would be way too hard to manage. We did the similar kind of thing. We were like, okay, so one of the things that you want to do when you *provide* a photo is you want to have a photo that's just a weensy bit off, like a little skewed. You don't want to take a picture of an engineering classroom and go, yeah, that's a classroom because it doesn't elicit it just sort of pfft ends. And so, you want to give something a little off.

And so one of the images that we gave was like a 1950s black and white image of Northrop, or Grumman, I can't remember which company, and it was these three white guys behind a table and they're all wearing their white shirts and their little skinny black ties, and the little cigarette ashtrays on the table, and there's a graph up on the wall and they're talking. And you and I might look at that and go, grrrr . . . talk about the gender aspects of it, talk about representedness, talk about other things kind of associated with the 50s. And the students who don't have that memory, this was actually unfamiliar to them, they would be like, oh, they would talk about collaboration and communication and teamwork and problem solving together, and the value of these representations to help you articulate what's going on. So, we were a little bit surprised we didn't get the gender thing, but it actually was feedback that we skewed the photo enough that it got them talking versus just sort of back to whatever and I don't need to say anything more.

- ***So, would there be general guidelines or advice you would give to people who want to try doing photo elicitation?***

- **Yeah, there's a lot of things to think about. I mean some of it is specifically about how to think about the photos, whether or not you provide photos or ask them to bring photos a little bit about what you're trying to get at, and then a probably some advice about just the experience of it. It feels very open-ended and a little off into the unknown, and if you've never done anything like that you might think that it's too subjective, or too open, or too unstructured, or too fill in the blank, but just too uncomfortable at the end of what's really going on.**

  And in that case, one of the things we did is we piloted it in our group and what you do is you get this opportunity to experience for yourself what's it like finding a photo, what's it like, you know, the rationale behind why that photo and what is it you wanted to talk about, and why is that so important to you. The interview protocol is super-important in terms of like what is the set of questions that keep bringing you back in a very open space to a very narrow and targeted focus. Trying to get at this phenomenon, not everything else.

  And then just debriefing on that and talking about your own experiences with that, and how it kind of takes on a story quality that's kind of fun. And it turns an interview into something that's less about being a guinea pig and more about being authentic and telling your story. So, that helps a lot.

  In terms of thinking about the photos, and whether or not you want to bring in photos or have people bring their own photos, if there's an idea you want to get at bringing in photos allows there to be some consistency across the

types of things that you're having everybody engage with, but then you have to really pilot that photo. You'd have to again like have that just a little bit of familiar but unfamiliar quality that gets people targeted to that particular phenomenon. The cool thing when you have people bring their own photos, the cool thing - and some of the reasons you might not do that is you might feel that that starts to be really complicated. But these days with the internet it's actually really easy.

Two of the students who worked for me on one of our projects wrote a paper for ASEE in, I think it's 2014, Kristen Hadden and Tiago Forin, and they talked about some of this. So, if you want more information, I'll just shout out to that, read the paper.

- ***And we can put a link to it on the website.***

❖ **Oh good, yay. We showed some of the examples and one of the things that happens when you allow people to bring their own photos it changes that subject/researcher dynamic. The subjects have agency and freedom to bring the thing that has meaning for them. And, whereas compared if you brought something there'll be a little bit of this quality of like, "Is that what you were looking for? Did I say what you were looking for?" And so, it gives them agency to talk about things.**

And sometimes, for example, in the work that I do, you know, for the cross-disciplinary project, for example, these are not things that people might feel comfortable talking about with people. I mean not that they're, they're not

horribly, horribly sensitive but they tend to be emotional. And the photos become a way for them to talk about something that perhaps wouldn't be as accessible in a normal format.

And so, I'm remembering one of the photos one of the people brought, and I remembered it wrong but I went and looked back and like, what was that photo? And it was a picture of a monk sitting at a riverbed with a bunch of tigers and he's sort of petting the tigers. And I was like, okay, so what is it that this photo represents to you about cross disciplinary work? And he's like, "This is what I feel like when I'm in those moments, on those teams working with those people, that there's just all these politics, and all these tensions, and all these sort of walls that people have about this kind of work. And I often find myself in this, you know, monk calming the dynamics so that we can work together better." And I can't think of a question that I would've asked or a photo that I would've brought that would've allowed me to hear that and at the same time knowing that this one of the things that people experience about that kind of work; this sort of incredibly emotional, charged, paradigm shifting thing. So, those are some key pieces of advice.

- ***Well it's a wonderful method that I love too. That's why I wanted to talk to you about it.***

❖ **Hey, it's fun. I mean it's fascinating what people will say if you give them enough of an opening and then really your job is to keep bringing them back to the phenomenon. So, your probes become the big thing. It's like so why is that important for you? You've talked about collaboration, what does**

that mean for you? Can you give me an example? So, it just becomes the probes.

- ***Well I want to ask a final question that takes advantage of you being in the community for a long time. Let's say there are listeners that are fairly new to the community, or not even in the community yet, what advice might you give them for entering the community?***

❖ **Rich Felder and I did an editorial and one of the things that was in that editorial was that there's a lot of different hats you can wear in this community. And I know you and Karl have done work in terms of understanding those hats in terms of educational research hats, right? And to me, all those different hats mean that there's a bunch of different pathways, you know, this isn't a one-size-fits all community. And so, if you've never done this before, start small; start really small and think about a class or a program and what's something that you really want to understand about it. And find some people who you can have conversations with.**

It would be excellent to find a collaborator at that phase. But that might be actually a little too soon, so just find somebody you can go have a coffee conversation. And that person will be able to hear what you're saying and make connections, and then maybe that becomes a jumping off point for part two and part three.

So, when I think about some of those roles, it's like maybe you just really

want to be a good teacher; maybe you're the innovator person, you just always want to try new things or develop new things. Or maybe you're the provocateur, like you're kind of always poking at the status quo and you're like, "Why are we doing it that way?" Or maybe you see your classroom or your program as a laboratory and it's like how would you go about studying it. So, those are just some of the ways.

The other one is that this is a huge playspace. There are so many different opportunities and kind of the first step is to try something and then go to a conference and talk about it with like-minded folks. There are good conferences. And this is a community that's super-super friendly. This is a community that has had their own experiences of feeling isolated or maybe not well-understood by their colleagues, putting it in a nice way. And they almost go out of their way to be very welcoming and be very engaging and sit down with folks. We both have talked about this that when we go to ASEE and FIE for example, it's sort of hard to make it down the hallway because as a community we're like, "Oh, you want to talk about this? Sure, let's go sit down and talk." And I don't know if I quite get that in other communities. So, start, engage, think small. Those are probably key things that I would go with.

- ***Well, again, some of the references that you discussed today, particularly the paper on photo elicitation we will be sure to have that on the website with the podcast. And we hope that these podcasts also can be kind of the beginning of a conversation for some of those folks that are the***

peripheral participators.

- **And we bring the photo project into the first day of many of our classes. So, in my design class I'll say bring an image of design, and then people bring all sorts of stuff and then that becomes a place to talk about stuff. So, it's also a technique you can use in the classroom and just by using it in the classroom you start to get an insight of how valuable it could be as a research method.**

  - ***Excellent. That's a great idea. Wonderful.***

    Robin, thank you so much, this has been a pleasure.

- **Thank you, Ruth. I have enjoyed doing this; it was fun kind of getting back into why did I end up down this pathway with photo elicitation in the first place? Ahh, I was puzzling because I couldn't get at something I really wanted to get at.**

  - ***The most fun things to find out about are often the hardest to find out about. So, this is a good method for doing that.***

- **Yeah, and the name is slightly different, but it shows up in a lot of different communities.**

  - ***Thanks again, Robin.***

Research Briefs is produced by the School of Engineering Education at Purdue.

- ***Thank you to Patrick Vogt for composing our theme music. The transcript of this podcast can be found by Googling "Purdue Engineering Education Podcast." And please check out my blog, RuthStreveler.Wordpress.com.***